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(54) Abstract Title

Tariff determination in mobile communication networks

(57) To determine a total call tariff in respect of a call from a mobile terminal currently registered with a foreign network a total call tariff request is sent from a charging node 7 of the foreign network 2 to a rating node 8 of the mobile telephone subscriber's home network 1, the message including a call tariff portion of the foreign network 2. At the rating node 8, the total call tariff is determined by applying a multiplying factor to the foreign network's tariff portion. The determined total called tariff is then sent to the charging node 7 of the foreign network 2 for advising the mobile terminal or debiting a pre-paid amount.

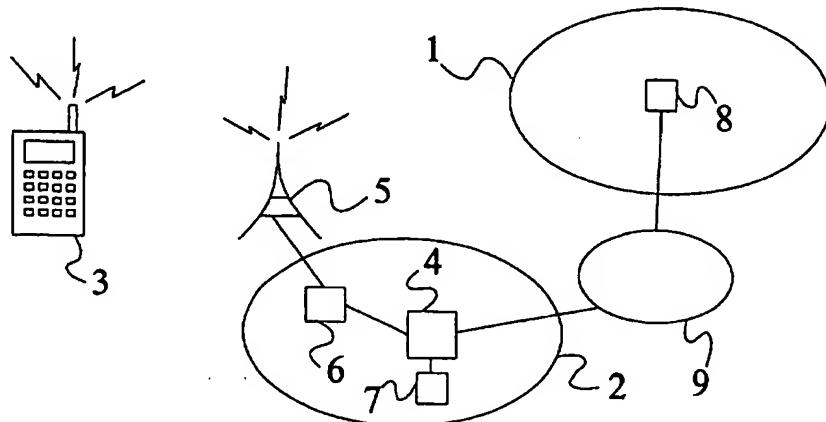
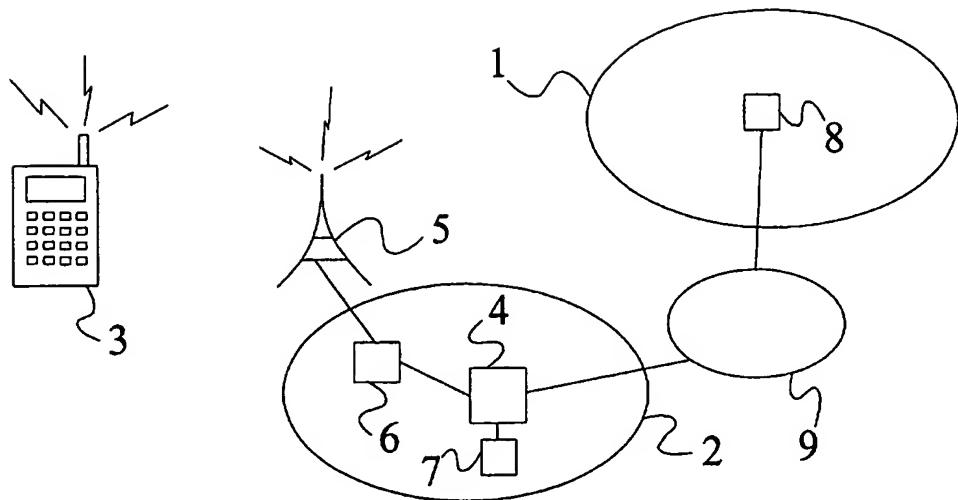
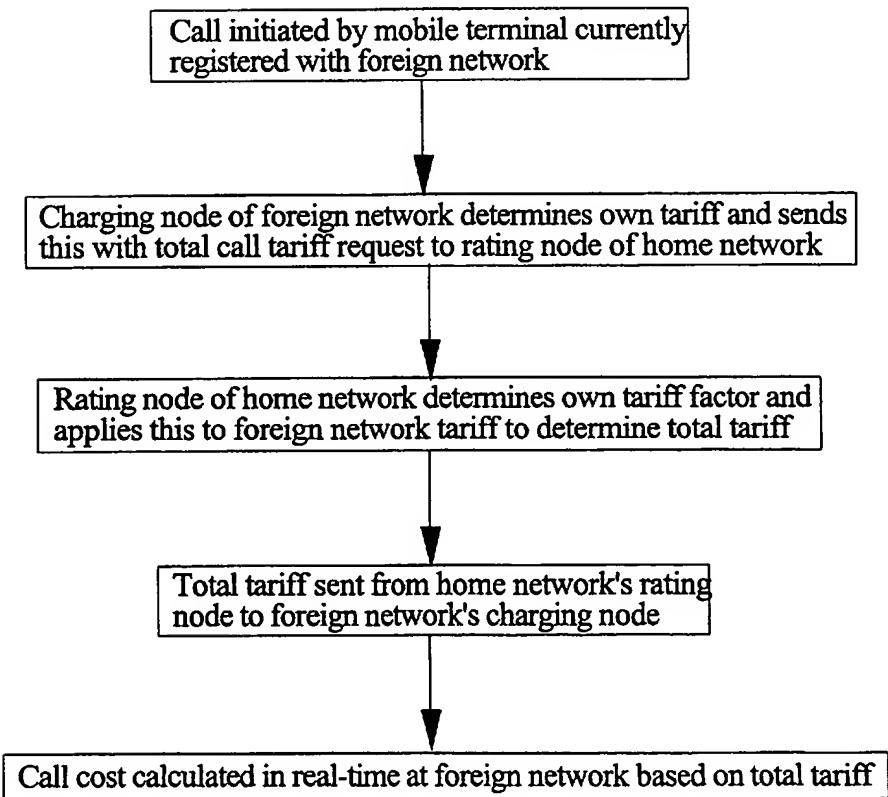


Figure 1

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**Figure 1****Figure 2**

TARIFF DETERMINATION IN MOBILE TELECOMMUNICATION NETWORKS

Field of The Invention

The present invention relates to call tariff determination in mobile telecommunication networks and more particularly to the determination of call tariffs for provision to an access network in respect of a mobile telephone subscriber.

Background to the Invention

In today's competitive mobile telephone market, in order to attract new customers operators are operating a diverse range of payment options. In addition to the conventional payment scheme where a subscriber is billed regularly for telephone calls made over a period immediately preceding the issuing of a bill, there is for example the prepaid card schemes where a user purchases a card and then uses a secret number provided on the card to top-up an account maintained by his operator. The user is able to make and receive calls until such a time as the balance in his account falls to zero. The account must be topped-up using a new prepaid card before the user can make and receive calls once more. Many new services are also being introduced by mobile telephone operators to attract new customers as well as to maintain their existing customer base. One such service which is in limited current use is known as "Advice of Charge" and allows mobile telephone's to be provided with call charge information during the call set-up phase to enable call charges to be computed by the telephone either during or after a call.

In a mobile telecommunications network, there is usually present a node which controls charging for subscribers of that network. This "charging" node maintains details of the tariffs charged by the operator for the complete range of call options, e.g. home mobile telephone to home mobile telephone, home mobile telephone to other national telephones, international tariffs, etc. Providing that a subscriber's telephone is registered with the home network, there is in principal no bar to providing services such

as Advice of Charge and to controlling and monitoring in real time prepaid card subscribers and the like, as all the necessary information is available at the home network's charging node (or can be readily obtained by that node). Problems arise however when a mobile telephone subscriber is not at home but rather is registered with some foreign mobile telephone network (the term "access" network is used below to describe the network to which a subscriber is directly connected).

Such a foreign access network will have its own charging node which must be able to determine real time charging information for a roaming subscriber if prepaid subscribers are to be allowed to roam, or if services such as Advice of Charge are to be available to roaming subscribers. Indeed this may be necessary whenever subscribers have a credit ceiling which must not be exceeded. However, the charging node of the foreign network does not necessarily know the call tariff to be applied by the subscriber's home network (it is the home network which has overall control of billing operations for its own subscribers). It is not realistic to expect every charging node in every network to be provided with a comprehensive list of caller tariffs applied by other network operators, as tariffs quickly become outdated and/or operators are not be willing to provide their own call tariffs to their competitors.

One solution to the above problem which has been proposed is to provide every network with a so-called "rating node" (for example a Service Control Point) which knows the tariffs of the network to which it belongs. When a roaming subscriber initiates a call using a foreign network as the access network, the charging node of the access network contacts a rating node of the subscriber's home network to obtain the home network's tariff for the call in question. This tariff is then returned to the charging node of the access network to enable it to calculate real time charging data.

A limitation of this proposed solution is that the rating node of the subscriber's home network does not know the tariff which the foreign network will apply to the call (this information is only provided to the home network after a termination of the call). Thus, the real time charging information generated at the charging node of the foreign network will be an estimate, based only upon the tariff of the home network and will not

correspond to the actual tariff applied to the call (and upon which the subscriber's telephone bill will be based).

Summary of the Invention

It is an objective of the present invention to overcome or at least mitigate the above noted disadvantages of existing and currently proposed solution of providing a real time call charging information to a foreign network which is acting as an access network for a roaming mobile subscriber.

According to a first aspect of the present invention there is provided a method of determining a total call tariff in respect of a call from a mobile terminal currently registered with a foreign network, the method comprising the steps of:

sending a total call tariff request from a charging node of the foreign network to a rating node of the mobile telephone subscriber's home network, said message including a call tariff portion of the foreign network;

at the rating node, determining said total call tariff on the basis of the foreign network tariff portion and a call tariff or charge factor of the home network; and

returning the determined total called tariff to the charging node of the foreign network.

Embodiments of the present invention provide a relatively easy and straightforward way of providing total call tariff information to a foreign network, which information represents the true tariff to be used by a subscriber's home network. In these embodiments, the home network retains control of the charging operation and furthermore there is no need for the home network to disclose complete details of its charging formula to the foreign network.

Preferably, the rating node applies a multiplier to the received foreign network's tariff portion in order to determine the total tariff.

According to a second aspect of the present invention there is provided apparatus for determining a total call tariff in respect of a call from a mobile telephone subscriber currently registered with a foreign network, the apparatus comprising means for sending a total call tariff request from a charging node of the foreign network to a rating node of the mobile telephone subscriber's home network, the message including a call tariff portion of the foreign network, means for determining at a rating node of the home network the total call tariff on the basis on the received foreign network's tariff portion and a call tariff or charge factor of the home network, and means for returning said total call tariff to the charging node of the foreign network.

Brief Description of the Drawings

For a better understanding of the present invention and in order to show how the same may be carried into effect reference will no be made, by way of example, to the accompanying drawings, in which;

Figure 1 illustrates schematically a telecommunication system, and

Figure 2 is a flow diagram illustrating a caller tariff determination method used in the system of Figure 1.

Detailed Description of Certain Embodiments

There is illustrated in Figure 1 a telecommunications system comprising a number of mobile telephone networks 1, 2. A first of the networks 1 is a mobile telephone network (e.g. using the GSM standard) and represents a home network to which a notional mobile telephone user subscribes. The network 1 is therefore responsible for charging this notional subscriber either by way of issuing bills for previous calls made, or by debiting a prepaid account held by the subscriber.

Figure 1 also shows a second mobile telephone network 2 and a mobile telephone 3 owned by the notional subscriber (it is assumed that the subscriber has inserted his

Subscriber Identity Module (SIM) card into the telephone). Assuming that the subscriber has left his home network 1 and has roamed into the coverage area of the foreign network 2, the terminal 3 registers with the foreign network 2 using the information stored in the SIM card. Subsequently, in order to set up a call, the terminal 3 makes contact with a Mobile Switching Centre (MSC) 4 of the foreign network via a Base Station 5 and a Base Station Controller 6. The foreign network's MSC 4 controls the routing of a call from the terminal 3 to the called B-number and in addition acts as a charging node 7 for the foreign network, collecting charging information during a call and subsequently relaying this to a charging node of the home network 1 following termination of the call. The foreign network's charging node 7 maintains the call tariffs applied by the foreign network 2 for a variety of calls, e.g. local, national, and international.

A "rating node" 8 is provided in the subscriber's home network 1 and maintains details of the tariffs of the home network 1. Typically, the home network has a single rating node 8 centrally located within the home network 1. The rating node 8 maintains a database containing formulae for computing tariffs of the home network 1.

When the mobile terminal 3 initiates a call, the MSC 4 of the foreign network sets up the call connection to the dialled B-number. In addition, the charging node 7 identifies the tariff t_1 upon which the foreign network 2 will base its charge. The charging node 7 then sends to the home network's rating node 8, via an SS7 signalling network 9, a request for the total call tariff which the subscriber's home network 1 will apply to the call initiated by the mobile terminal 3. This request includes both the dialled B-number in addition to the call tariff t_1 of the foreign network 2. At the home network's rating node 8, a total tariff t_2 is computed based on the tariff t_1 and possibly the dialled B-number. Assuming for example that the home network determines from the B-number and the current location of the subscriber that it will levy an administrative fee of 5% over and above the called tariff of the foreign network, as well as a 22% VAT element, the home network will multiply the foreign network's tariff t_1 by a factor of 1.27 to obtain the total tariff t_2 . The rating node of the home network then returns the total tariff t_2 to the charging node 7 of the foreign network 2 in an appropriate message. This

message, and the total tariff enquiry message, may be sent in GSM networks using the INAP protocol (or Camel Application Protocol CAP).

When the charging node 7 of the foreign network 2 receives the total call tariff t_2 , the node 7 is able to complete the call connection between the mobile terminal 3 and the dialled B-number. As already noted, the call tariff t_2 may be used either to provide real time Advice of Charge to the subscriber, where the cost incurred so far (or total cost) is displayed on a display of the subscriber's terminal 3, or to debit a prepaid account of the subscriber. In the latter case, the subscriber's home network 1 may forward to the charging node 7 of the foreign network 2, together with the total call tariff t_2 , the current balance of the subscriber's prepaid account.

It will be appreciated by the person of skill in the art that various modifications may be made to the above described embodiment without departing from the scope of the present invention.

CLAIMS

1. A method of determining a total call tariff in respect of a call from a mobile terminal currently registered with a foreign network, the method comprising the steps of:

sending a total call tariff request from a charging node of the foreign network to a rating node of the mobile telephone subscriber's home network, said message including a call tariff portion of the foreign network;

at the rating node, determining said total call tariff on the basis of the foreign network tariff portion and a call tariff or charge factor of the home network; and

returning the determined total called tariff to the charging node of the foreign network.

2. A method according to claim 1, wherein the rating node applies a multiplier to the received foreign network's tariff portion in order to determine the total tariff.

3. Apparatus for determining a total call tariff in respect of a call from a mobile telephone subscriber currently registered with a foreign network, the apparatus comprising means for sending a total call tariff request from a charging node of the foreign network to a rating node of the mobile telephone subscriber's home network, the message including a call tariff portion of the foreign network, means for determining at a rating node of the home network the total call tariff on the basis on the received foreign network's tariff portion and a call tariff or charge factor of the home network, and means for returning said total call tariff to the charging node of the foreign network.



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Claims searched: all

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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.Q): H4L (LDTT, LDPP)
Int Cl (Ed.6): H04Q 7/22
Other: Online: WPI, EPODOC, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	WO 96/31072 A1 (ERICSSON) see whole doc.	1,3

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.